Two new species of the genus *Scrobipalpa* Janse, 1951 (Lepidoptera, Gelechiidae) from Ukraine

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Abstract. *Scrobipalpa arenicola* **sp. nov.** and *S. burkutica* **sp. nov.** are described from the Lower Dnipro Sands in the Kherson region of Ukraine. The differences in external characters and genitalia of the new species from their congeners are discussed. Photographs of the adults and genitalia of the new species are provided as well as DNA barcodes of *S. arenicola* **sp. nov.** and related species.

Introduction

Scrobipalpa Janse, 1951 with more than 300 Palaearctic (Povolný 2002; Bidzilya et al. 2019; Huemer and Karsholt 2020; Bidzilya et al. 2022), ten Nearctic (Lee et al. 2009), 36 Afrotropical (Bidzilya 2021) and five Australian species (Povolný 1977) is the most diverse genus of the tribe Gnorimoschemini and also one of the most diverse genera in the family Gelechiidae. As a result of a revision of European *Scrobipalpa* (Huemer and Karsholt 2010), 103 species had been recognized as occurring in Europe. Later, additional species have been described from Ukraine (Bidzilya and Budashkin 2011), France (Varenne and Nel 2013, 2017, 2018) and the Volga region of Russia (Anikin and Piskunov 2018). These records have been included in the list of European *Scrobipalpa* that now comprises 112 species (Huemer and Karsholt 2020). Most recently, two more species have been described from Spain (Huemer 2021) and the southern Urals of Russia (Bidzilya et al. 2022).

In 1999, Eugeny Rutjan (Kyiv, Ukraine) collected in the Tchernomorsky Nature Reserve (Kherson region of Ukraine) a series of males that could not be assigned to any known species of *Scrobipalpa*. In the account of *S. hyoscyamella* (Stainton, 1869) in their monograph on the European Gelechiidae Huemer and Karsholt (2010: 159) record that they examined a male from Ukraine with almost identical genitalia but with a rather different forewing colour and markings stating that it was uncertain whether it was a different species. They illustrated the genitalia (2010: 402, fig. 94a) as "*Scrobipalpa* cf. *hyoscyamella* (Stainton)". In 2017, the present author collected three additional males of this species in another locality but in the same biotope. DNA barcodes (mtCOI gene) confirmed that these specimens represent an undescribed species of *Scrobipalpa*, whose description is given here. The second species was collected in sympatry with the first species. This species possesses a unique set of external and genitalia characters in both sexes that separate it clearly from all other *Scrobipalpa* species, and it is described here as a new species.

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Material and methods

Male and female genitalia were dissected and prepared using standard methods (Huemer and Karsholt 2010). Male genitalia were spread using the unrolling technique described by Pitkin (1986) and Huemer (1988). Pinned specimens and details of external morphology were photographed with a Canon EOS 5DSR DSLR camera attached to a light box. Slide-mounted genitalia were photographed with a Canon EOS Rebel T5 DSLR camera attached to an Olympus U-CTR30-2 trinocular head mounted on a Carl Zeiss compound microscope. For each photographed specimen, sets of 10–20 images were taken at different focal planes and focus-stacked using Helicon Focus 6 with the final image edited further in Adobe Photoshop CS5.

Tissue samples from three specimens of *S. arenicola* sp. nov. were prepared to obtain DNA barcode sequences of a 658 bp segment of the mitochondrial COI gene (cytochrome c oxidase subunit 1). The tissues were successfully processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) using the standard high-throughput protocol described in deWaard et al. (2008). In addition, respectively, three DNA barcode sequences of the two closest species from the Barcode of Life Data Systems (BOLD; Ratnasingham and Hebert 2007, Ratnasingham 2018) were used for analysis. All sequences were assigned Barcode Index Numbers (BINs), algorithm-based operational taxonomic units that provide a reasonably good proxy for species level (Ratnasingham and Hebert 2013). Further details including complete voucher data and images can be accessed in the public dataset "New species of *Scrobipalpa* from Ukraine - [DS-SCROUKRA]" (https://www.boldsystems.org/index.php/MAS_Management_DataConsole?codes=DS-SCROUKRA) in the Barcode of Life Data Systems BOLD (Ratnasingham and Hebert 2007).

Degrees of intra- and interspecific variation of DNA barcode fragments were calculated using the Kimura two-parameter model on the platform of BOLD systems v. 4.0. (https://boldsystems.org). A Neighbor-Joining tree was constructed using the Kimura two-parameter model in MEGA7 (Kumar et al. 2016).

The material examined including holotypes is deposited in Zoological Museum Kyiv Taras Shevchenko National University, Kyiv, Ukraine (ZMKU), some parartypes - in the Tiroler Landesmuseum Ferdinandeum, Hall in Tirol, Austria (TLMF) and the Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark (ZMUC).

The descriptive terminology of the genitalia structures follows Huemer and Karsholt (2010).

Results

Scrobipalpa arenicola sp. nov.

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Figs 2–5, 10–13

Scrobipalpa cf. *hyoscyamella* (Stainton) – Huemer and Karsholt 2010: 402, fig. 94a.

Material examined. ***Holotype***: UKRAINE • ♂; Kherson reg., Holopristanskiy distr., Burkuty vill. env.; 21 Jun. 2017; O. Bidzilya leg; gen. slide 150/17, O. Bidzilya; TLMF Lep28327; BankIt2704426 gnl|uoguelph|PALEA032-20.COI-5P; OQ992194; ZMKU.

***Paratypes*:** UKRAINE • 2 ♂; same data as for holotype; gen. slide 149/17, O. Bidzilya; TLMF Lep28328; TLMF Lep 28329; BankIt2704426 gnl|uoguelph|PALEA034-20.COI-5P; OQ992195; ZMKU • 9 ♂, 1 ♀; Ukraine, Tchernomorskiy Nature Reserve, Ivano-Rybalchanskiy loc.; 28–30 Apr. 1999; E. Rutjan leg.; gen. slide 40/09♂, 89/10♀, 59/23♂, 143/23♂, O. Bidzilya; 01 1061♂, PH; TLMF; ZMKU; ZMUC.

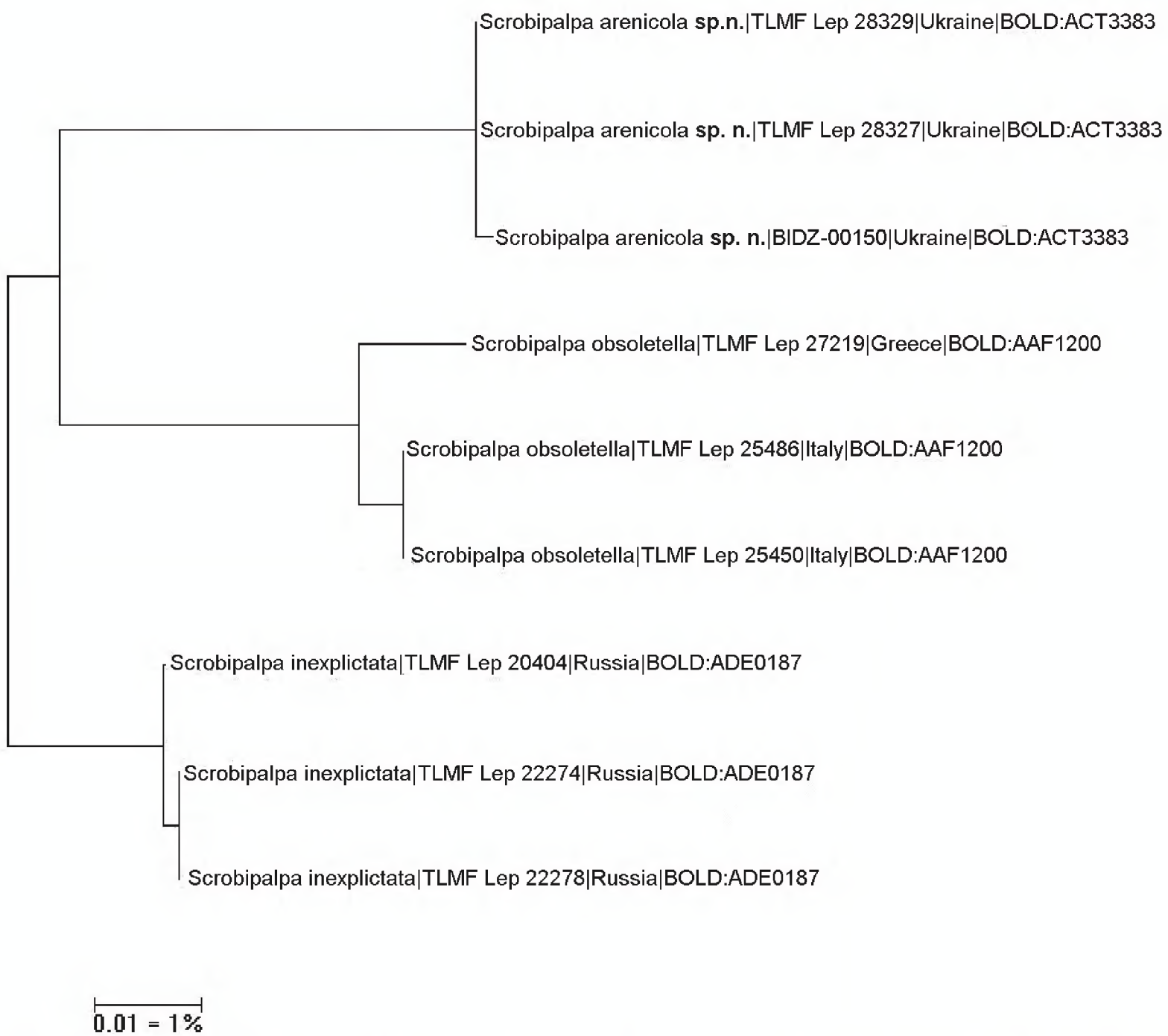
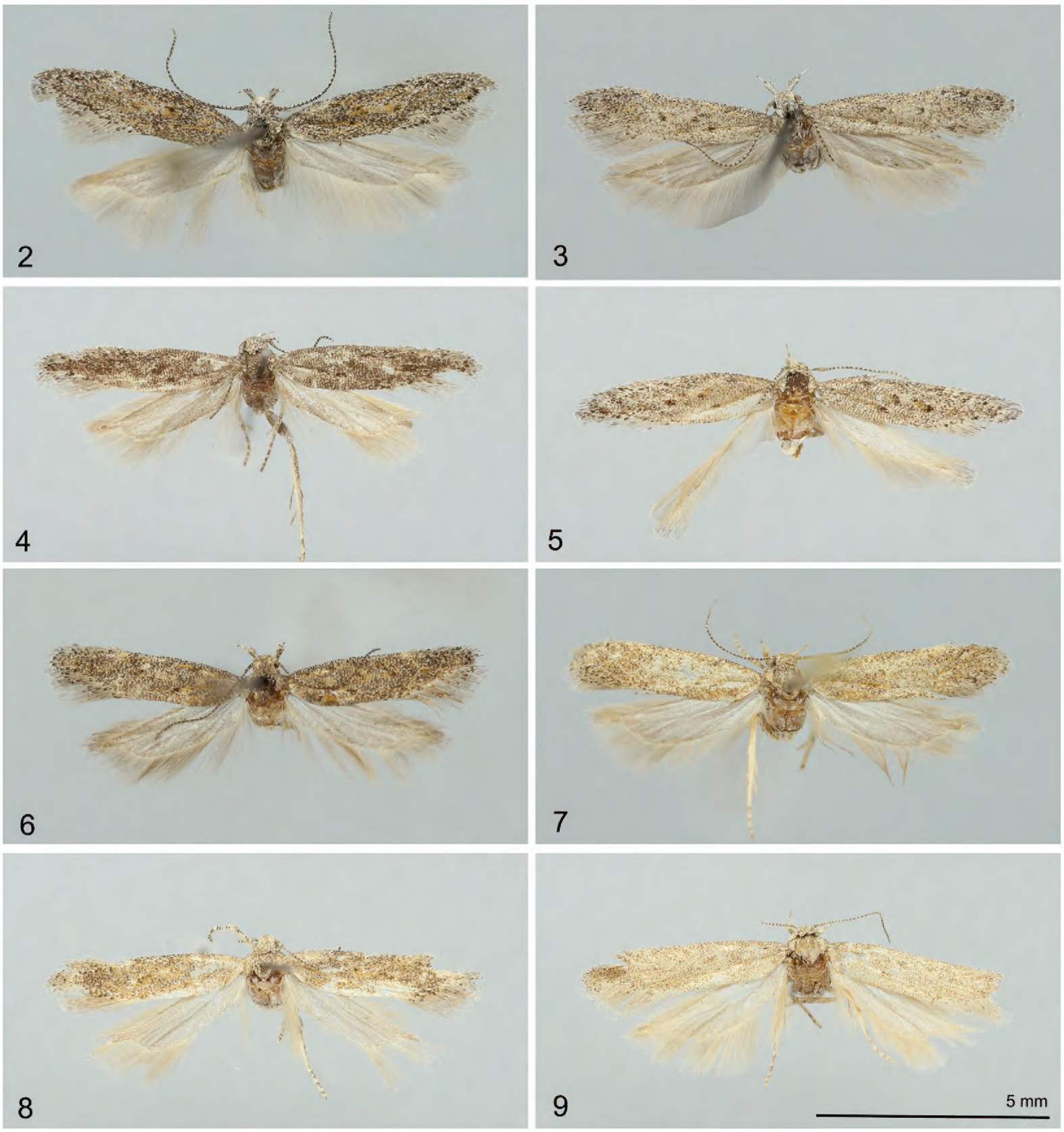


Figure 1. Neighbor-joining tree of *Scrobipalpa arenicola* sp. nov. and its closest species, *S. obsoletella* (Fischer von Röslerstamm, 1841) and *S. inexplictata* Bidzilya, Huemer & Šumpich, 2022, in BOLD.

Diagnosis. Externally (Figs 2–5) *S. arenicola* sp. nov. is almost indistinguishable from *S. arenbergeri* Povolný, 1973 (Fig. 6) and *S. pauperella* (Heinemann, 1870) but the forewing is narrower, with a less distinct black pattern, and is smaller in wingspan (9.7–10.0 mm as opposed to 11.0 mm in *S. arenbergeri* and 12–15 mm in *S. pauperella*). *Scrobipalpa proclivella* (Fuchs, 1886) is also extremely similar to the new species but the black spots are usually elongate and the underside of the abdomen is paler cream (Gregersen and Karsholt 2022: 194). The male genitalia are identifiable by the trapezoidal uncus with straight or weakly emarginated posterior margin, short valva (not reaching top of uncus), long sacculus (1/3 length of valva) and a slender saccus. *Scrobipalpa*

karadaghi (Povolný, 2001) has similar valva, sacculus and vincular process (Fig. 15), but the new species clearly differs in the trapezoidal uncus and very slender saccus. The differences from *S. burkutica* sp. nov. are explained under the diagnosis of that species.

Description. Adult (Figs 2–5). Wingspan 9.7–10.0 mm. Head covered with grey brown-tipped scales, labial palpus recurved, segment 2 grey mottled with brown, outer and upper surface white, lower surface with groove beneath, segment 3 1/2 length and 1/2 width of segment 2, pointed acute,



Figures 2–9. *Scrobipalpa* spp., adults. **2–5.** *S. arenicola* sp. nov. **2.** HT, male (gen. slide 150/17, O. Bidzilya). **3.** PT, male (gen. slide 149/17, O. Bidzilya). **4.** PT, male (gen. slide 114/23, O. Bidzilya). **5.** PT, female (gen. slide 89/10, O. Bidzilya). **6.** *S. arenbergeri*, male. **7–9.** *S. burkutica* sp. nov. **7.** HT, female (gen. slide 141/23, O. Bidzilya). **8.** PT, female (gen. slide 67/07, O. Bidzilya). **9.** PT, male (gen. slide 9/11, O. Bidzilya).

greyish brown with diffuse medial ring and white apex; scape grey mixed with brown, flagellum grey ringed with brown; thorax and tegula concolorous with head; forewing covered with grey scales tipped with brown or black, a pair of black spots in middle of cell, black spot at cell corner and on fold, veins and fold weakly mottled with light brown, fringes grey brown-tipped; hindwing and fringes grey.

Variation. Specimens may appear lighter or darker depending on the development of black-tipped scales on the forewing; black markings are reduced in some specimens.

Male genitalia (Figs 10–13). Uncus trapezoidal, gradually narrowed posteriorly, posterior margin straight or weakly emarginate; distal sclerite of gnathos short, weakly curved; tegumen broad, with indistinct transition to uncus, anteromedial emargination broadly rounded, extending to 1/3 length of tegumen; valva slender, gradually curved, of even width except weakly inflated apex, extending to 1/2–2/3 length of uncus; sacculus gradually curved inwards, extending almost to 1/2 length of valva, twice as broad as adjacent part of valva, with pointed apex; vinculum twice as broad as long, posteromedial emargination deep, triangular, vincular process short, subtriangular, with distinct pointed tip, as broad at base as sacculus, extending to 1/2 length of sacculus; saccus broad at base, then slender, parallel-sided, apex obtuse, extending slightly beyond pedunculus; phallus nearly parallel-sided, weakly narrowed apically, apical arm slender, coecum strongly inflated, almost equal in length to phallic trunk.

Variation. Uncus varies in length, vincular processes slightly vary in width and length.

Female genitalia. Unknown (the genitalia slide 89/10 with the female genitalia was broken).

Molecular data. BIN, BOLD:ACT3383. The intraspecific average distance of the DNA barcode region is 0.12% (n = 3). The minimum distance to the nearest neighbor, *S. inexplictata* Bidzilya, Huemer & Šumpich, 2022 (BIN, BOLD:ADE0187), is 5.77% (p-dist) (Fig. 1).

Biology. Adults have been recorded in late April and late June. The species inhabits dunes and sand steppes in the Lower Dnipro Sands in the Kherson region of Ukraine (Figs 18–21).

Distribution. Ukraine: Kherson region.

Etymology. The specific epithet is derived from the Latin words "*arena*" - sand, and "*colo*" - to inhabit, and indicates the restriction of the new species to sandy habitats.

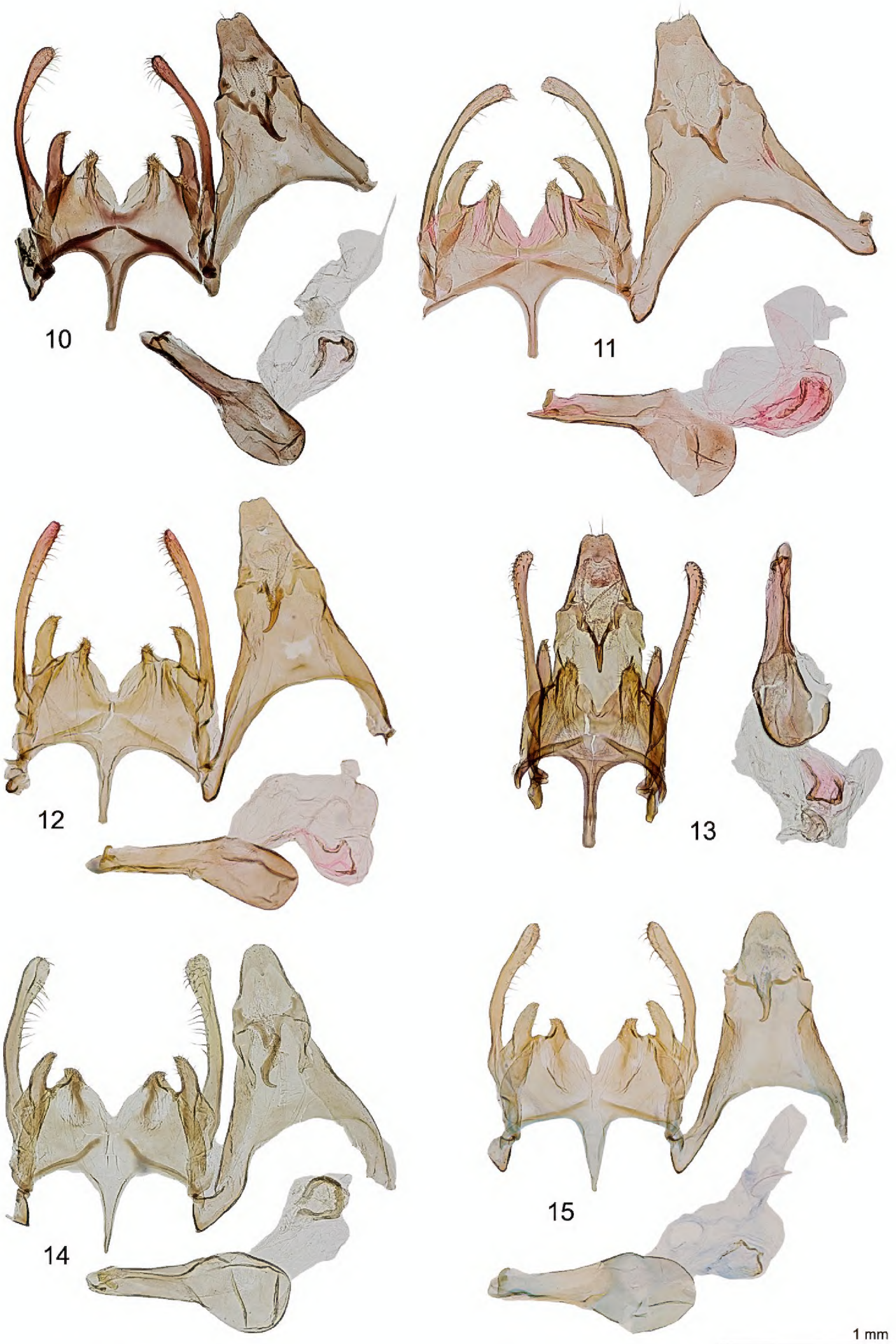
Scrobipalpa burkutica sp. nov.

https://zoobank.org/FC38F514-2D2D-46C6-AB24-1A604B079EF7

Material examined. ***Holotype*:** UKRAINE • ♀; Kherson reg., Holopristanskiy distr., Burkuty vill. env.; 21 Jun. 2017; O. Bidzilya leg; gen. slide 141/23, O. Bidzilya; ZMKU.

***Paratypes*:** UKRAINE • 1 ♂, 1 ♀; Tchernomorskiy Nature Reserve, Ivano-Rybalchanskiy loc.; 28–30 Apr. 1999; E. Rutjan leg.; gen. slide 67/07♀, 9/11♂, O. Bidzilya; ZMKU.

Diagnosis. *Scrobipalpa burkutica* sp. nov. is characterized by the uniformly greyish brown forewing with ochreous suffusion (Figs 7–9). *Scrobipalpa vasconiella* (Rössler, 1877) has a more contrasting forewing with a distinct black pattern. *Scrobipalpa amseli* Povolný, 1966 has the forewing with same ground colour, but differs in having black spots in the cell. The new species can be confused with unicolorous specimens of *S. nitentella* (Fuchs, 1902) with reduced markings (see Gregersen and Karsholt 2022, fig. 205 f). The male genitalia resemble those of *S. karadaghi* (Fig. 15) but in the latter the uncus is shorter and less produced, the valva is narrower at the base, the vincular process is slightly longer and wider, and the saccus is broader at the base. The male genitalia



Figures 10–15. *Scrobipalpa* spp., male genitalia. **10–13.** *S. arenicola* sp. nov. **10.** HT (gen. slide 150/17, O. Bidzilya). **11.** PT (gen. slide 01 1061, PH). **12.** PT (gen. slide 143/23, O. Bidzilya). **13.** PT (gen. slide 149/17, O. Bidzilya). **14.** *S. burkutica* sp. nov., PT (gen. slide 9/11, O. Bidzilya). **15.** *S. karadaghi* (gen. slide 7/19, O. Bidzilya).

Figures 16, 17. *Scrobipalpa burkutica* sp. nov., female genitalia. **16.** HT (gen. slide 141/23, O. Bidzilya). **17.** PT (gen. slide 67/07, O. Bidzilya).

differ from those of *S. arenicola* sp. nov. in the rounded posterior margin of the uncus (straight or weakly emarginate in *S. arenicola* sp. nov.), broader valva, the sacculus more distinctly narrowed apically, the vincular process broader at base than the adjacent part of the valva (as broad as the adjacent portion of the valva in *S. arenicola* sp. nov.) and a basally broader saccus. The female genitalia are characteristic with papillae anales subrectangular in the basal half, sternum VIII twice as broad as long, with distinct sclerotised anterior edge and rounded lobes of ventromedial depression that are densely covered with reticulate network of sclerotised ridges that does not extend beyond the anterior margin of sternum VIII. *Scrobipalpa wiltshirei* Povolný, 1966 seems to be most similar in respect of the female genitalia, but differs in having a deeper anteromedial emargination between the lobes of the ventromedial depression, and subovate papillae anales.

Description. Adult (Figs 7–9). Wingspan 10–12 mm. Head covered by greyish brown scales with dark brown tips, labial palpus recurved, segment 2 light brown mottled with dark brown, inner and upper surface pale, with groove beneath, segment 3 light brown with broad pale medial ring and whitish tip, scape brown mixed with grey, flagellum brown ringed with grey thorax and tegula concolorous with head; forewing plainly coloured, covered with grey to ochreous-brown scales with dark brown tips, fold ochreous-brown with a very indistinct brown marking, fringes grey to light brown, tipped with dark brown; hindwing grey, fringes concolorous.

Variation. The forewing of the female paratype is distinctly mixed with dark brown and is smaller in size.

Male genitalia (Fig. 14). Uncus subtriangular, rounded apically, with indistinct transition to tegumen; distal sclerite of gnathos long, hook-shaped; tegumen subtriangular, anteromedial emargination broadly rounded, extending to 1/3 length of tegumen; valva moderately broad, of even width except slightly inflated apex, weakly curved, extending to top of uncus; sacculus gradually curved, apex pointed, about 1/3 length of valva; vinculum twice as broad as long, anteromedial emargination triangular, vincular processes subtriangular with outwardly curved tip, short, broad at base, extending to mid-length of sacculus; saccus subtriangular, widening posteriorly, pointed, extending slightly beyond pedunculus; phallus nearly parallel-sided, apical arm slender, coecum strongly inflated, slightly shorter than phallic trunk.

Female genitalia (Figs 16, 17). Papillae anales subrectangular in basal half, then narrowing on outer edge towards apex; apophysis posterioris three times as long as segment VIII and twice length of apophysis anterioris; segment VIII twice as broad as long, subrectangular, with distinct sclerotised anterior edge, lobes of subgenital plates broadly separated anteromedially and more closely connected posteromedially, with broad patch consisting of reticulate network of sclerotised ridges at base of apophysis anterioris; lobes of ventromedial depression broadly rounded, separated anteromedially by a short triangular incision, densely covered with reticulate sculpturing which overlaps laterally with medial portion of lobes of ventromedial depression; apophysis posterioris slightly longer than segment VIII, slender, acute; ductus bursae distinctly broadened anteriorly, gradual transition to corpus bursae, colliculum short, ring-shaped, corpus bursae ovate, signum with large subtriangular weakly serrated basal plate, distal hook slender, nearly straight.

Variation. Female paratype differs in the signum having a smaller basal plate and distinctly curved distal hook.

Molecular data. No DNA barcode available.

Biology. Adults have been recorded in late April and late June. The species inhabits dunes and sand steppes in the Lower Dnipro Sands in the Kherson region of Ukraine (Figs 18–21).

Distribution. Ukraine: Kherson region.

Figures 18–21. Dunes and sandy steppe in Oleshki sands in the Kherson region of Ukraine – habitat of *S. arenicola* sp. nov. and *S. burkutica* sp. nov.

Etymology. The specific epithet is derived from the Burkuty village in the Kherson region of Ukraine which is the type locality of the new species.

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